THE NATIONAL GEOGRAPHIC MAGAZINE

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VOL. XII, No. 9 WASHINGTON SEPTEMBER, 1901

THE NATIONAL GEOGRAPHIC MAGAZINE

SIBERIA

BY PROF. EDWIN A. GROSVENOR

MY subject is in striking contrast to the subjects upon which during this Lenten course learned lecturers have spoken from this platform. Their topics have been India, China, and southwestern Asia. Under the latter term were grouped Chaldea, Babylonia, Persia, Judea, and Arabia—that is, they have pictured the empires which are most ancient and the civilization the most hoary. In graphic résumé they have described what was accomplished on the venerable banks of the Ganges and Indus and Hoang-ho, of the Tigris and Euphrates and Jordan. The very mention of those regions suggests everything that is splendid and old. The distinguished Vice-President of this Society, when he sums up what his predecessors have said and supplies all that they have omitted, will have as his topic "Asia, the cradle of the race."

My subject, Siberia, evokes no association of ancient greatness and achievement. Its meagre history is confined to the last few centuries. Rich currents of human life have never flowed across it. The past of China, India, and southwestern Asia teems with power and wealth and glory. The past of Siberia has been in almost every mind only the synonym of polar dreariness and desolation coupled with penal settlements and convict stations.

But what are India, Babylonia, Judea, and Arabia today? What influence do they in their present state exert upon the advance of humanity? Is there any indication of future or even present grandeur in the shadow they now cast upon the world's map? Even China, the long-lived empire, in whose antiquity cycles seem like years, has as its highest concern merely to exist, merely to defer for a season the dismemberment and dissolution which, however long delayed, are ultimately sure.

From them, dead or dying, we turn northward to Siberia, to that enormous tract which reaches from the Altai Mountains to the Arctic Ocean, from the Urals to the Pacific. No prophetic eye is needed, only the eye which seeing causes foresees results, to anticipate the day when Siberia itself shall be the greater Russia of the centuries which are to come.

THE TWO CONQUESTS

Prior to this great result two conquests were necessary. The first con-

quest was to bring the domain under a single master, either an individual or a nation, so that throughout the wide extent only one authority should be acknowledged. This was to be a conquest by force over the barbarians and scattered tribes which constituted its only inhabitants. It was possible whenever sufficient force from outside should be employed. The second conquest was that over inhospitable and hostile nature, over distance and climatic conditions. It was to introduce a national element and make a cold and repellent region pulsate with the warmth and energy of national impulse and life. It was to conquer the wilderness by civilization, but a wilderness which the civilization of even the recent past would have been unable to subdue. Through the centuries for this second conquest the land had been waiting. Civilization has been well defined as the victory of mind over external obstacles. Not till the close of the nineteenth century had science furnished civilization the arms for the subjugation of Siberia.

THE FIRST CONQUEST

It is of interest and significance to us Americans when recalling our colonial history to observe how while one wave pressed outward across the Atlantic another wave pressed eastward into Asia. The stream of European conquest which reached the American shores from western Europe was paralleled in Siberia by a contemporaneous stream of conquest from eastern Europe.

In 1558 the English Elizabeth began her memorable reign. That same year Ivan the Awful gave Gregori Strogonoff twenty square miles of desert land upon the River Kama, with permission to attack anything toward the east. "The Good Companies of the Don," a euphemistic name for the mob of brigands and outlaws, furnished an army. Irmak Timofeeff, the more than Pizarro or Cortez of the Slavs, became chief commander of their wild forces. Having no seas to cross, there was no need for him to embark and disembark his troops. He could always be marching on. In 1580 the brigand chief attacked and carried by assault Sbir, the capital of a powerful descendant of Genghis Khan. Ever since the province has been called Sibir, or Siberia, from the name of the conquered capital. Streams of Cossacks followed and spread in every direction from the path he had marked out. In 1649 Khabaroff, with three cannon and one hundred and fifty men, marched to the extreme east and occupied the Amur Basin. That territory then owed a nominal allegiance to China, and from it the Russian adventurers were compelled to retire by the treaty of Nevshink. Meanwhile resolute explorers and pioneers had been pushing northward and eastward all over the trackless waste which lay between Russia and the Pacific. Meanwhile in America men as dauntless and determined had been pushing westward from the Atlantic in continuous warfare with nature and the Indians.

Nicolas Nicolaievitch Muravieff was made governor of eastern Siberia in 1847. He was the son of an illustrious father and one of five illustrious brothers, all of whom served Russia well. He realized that what the Nile is to Egypt the Amur is to Siberia. It was then an almost unknown river. In obedience to his orders, Lieutenant Nevelsky made forty-five ineffectual attempts to find its mouth. He succeeded only at the forty-sixth. Herein is illustrated both the geographic ignorance of the time and the tireless persistence of the Russian.

Muravieff sent to the Chinese Government at Pekin asking permission to navigate the river. Without waiting for an answer that would probably never come, he embarked upon its bosom May 18, 1854. It was the time of the Cri-

mean War. Allied Great Britain, France, Turkey, and Sardinia were hammering at the ramparts of Sebastopol, which they finally took after a siege of three hundred and fifty-one days and the loss of over 100,000 men. In 1860 Count Ignatieff, "alone and unsupported save for Russian prestige," obtained from the Chinese Government its signature to the treaty of Pekin. Thereby the left bank of the Amur and the right bank of the Usuri were ceded to Russia. In point of fact, China in no way suffered from the cession. She had derived no revenue from the ceded territory and had never sent governors into it or exercised any control over it. None the less, that acquisition was to be so momentous in its consequences that, in comparison, the temporary check received by Russia at Sebastopol was a bagatelle. By that treaty the first conquest of Siberia became complete. In its entirety it recognized the authority of the Tsar. From the banks of the Neva north of the Altai Mountains as far as the Sea of Japan the whole prodigious tract was under a single rule. While the world looked on, Russia, almost unconsciously, was shifting her maritime base; alone of the European states, she from her continental dominions looked out upon eastern seas. Though other western nations held isolated ports and islands in eastern waters, Russia alone reached and dominated those waters by broad territorial possessions that were continuous.

VLADIVOSTOK

Though holding a coast line of many hundred miles along the Pacific, she then possessed no city or inhabited tract adjacent to a harbor upon its shores. In 1861 forty men were sent by Alexander II. They landed at the head of a bay bearing the significant name of Bay of Peter the Great, at the extreme southeastern point of the Russian possessions in Asia. Erecting a fort, with a presumption that seems amusing, they gave to the spot the name of Vladivostok, "The Mistress of the East." Other fortifications were erected, and a city speedily arose, which boasts over 40,000 inhabitants today. It is lighted by electricity and shows every indication of western progress. Its erection on that splendid and potential harbor is a typical illustration of the fruits that spring from the establishment of Russian Government in Siberia.

PHYSICAL CONDITIONS IN SIBERIA

In discussing Siberia, statements of dimension and distance confuse and bewilder rather than enlighten. It is of small advantage to dwell upon its area of over 4,900,000 square miles. If the forty-five states which compose the American Union were taken up and planted bodily in the midst of Siberia, they would be enclosed in every direction by a wide border of land. In this border territory all the countries of Europe except Russia could likewise be planted bodily, and there would remain still unoccupied 300,000 square miles, an area twice the size of imperial Germany. We have now to consider certain gloomy and repellent facts that at first discourage speculation and half paralyze hope. Only as we realize what Siberia is, only as we consider the immense disadvantages as well as the advantages of its geographic position, can we take into full account what Siberia is and what it will be. The victory of arms is complete. The victory of settled life, of laborious industry, of applied science, is but begun. But the hero who carries the sword is inferior to the pioneer, and the colonist who wars with unwilling nature utilizes its locked-up resources and compels it to serve him. The southeastern portion of Siberia is an immense plateau in the midst of mountains. Toward the west and

north it takes the form of a prodigious plain, which descends gradually to the Arctic. Plain and plateau are alike north of the fiftieth degree north latitude—that is to say, that its most southern points, except along the Amur and the Usuri and in west Siberia, are farther north than any locality in the United States. Its Cape Chelyuskin, in 77° 36′ north latitude, reaches nearer to the Pole than any other continental spur of land in either hemisphere. Shut in by mountains from the Pacific and the south, Siberia is open and without protection to the winds from the Arctic. So, scattered over its surface, are tracts unsurpassed in intensity of cold. In this regard Verhoyansk has the preëminence. Its average temperature during the three winter months is —53° Fahrenheit, while sometimes an extreme of —90° is reached. Its average annual temperature is only two degrees above zero; yet even there human beings cling like the moss and lichens and manage to exist the whole year through. The trend of land gives a northern direction to the masses of water—the Obi, the Yenisei, the Lena, and their tributaries—which we call rivers and which for months through much of their course are frozen rather than flowing seas.

THE ZONES

The 4,900,000 square miles of territory naturally divide into three roughly parallel zones. North of an imaginary line, in general coinciding with the sixty-ninth parallel, is the zone of the tundra. Here are comprised about 1,600,000 square miles. In a part of this territory the ground is frozen throughout the year, in winter to the depth of 40 feet, yet something like 100,000 human beings know no other home than the tundra. Between the sixty-ninth and sixtieth parallels is the forest zone, covering an extent of about 2,320,000 square miles and containing a population of less than 1,000,000. The supply of timber is practically exhausted. Its fur-bearing animals render it above any other part of the globe the land of the fur hunter. Its broad rivers are packed with fish. Its wealth of minerals and metals is accessible in the very surface of the ground. South of the sixtieth parallel is the zone of arable land, embracing about 900,000 square miles in a belt nearly 4,000 miles long and from 250 to 300 miles wide. This is the Siberia which today counts the most. It is the part now being brought into intimate connection with the rest of the world. The prime requisite for its development has been inhabitants, and then means of communication and transportation. Beside unequalled capacity for the production of cereals, it is dotted all over with great deposits of coal, iron, gold, and the most useful and valuable minerals and metals. The word Altai means golden.

COLONIZATION

But in the mind of the Russian, no less than of the foreigner, Siberia up to a few years ago has meant only suffering and exile. It seemed set apart by God and the Tsar as the prison-house of the outlaw and the felon. In 1899 a ukase of Nicholas II forbade the entry hereafter of convicts and suspected persons, and thus ended its woeful old-time mission forever.

From the dawn of creation up to the present time Siberia has been waiting even as North America waited through the ages for the states that were to arise within its boundaries. In 1888 its real colonization began when 26,000 immigrants crossed its frontiers. Then 30,000 came in 1889, 36,000 in 1890, 60,000 in 1891, 100,000 each year from 1892 to 1896, then 150,000, 200,000, and now more than 250,000 annually. While excluding undesirable persons, the government adopts generous measures toward

worthy immigrants. To every family, when desired, it advances $25 for the expenses of the journey, assigns gratuitously 40 acres to each man on his arrival, and further promises to assist with a loan of $50. The only great landlord is the emperor or the state. Serfdom has never existed east of the Urals. Even political conditions, as affecting the colonist, are not greatly unlike those west of the Mississippi before the construction of the Pacific Railroad. The present population is over 7,000,000 persons. Among them are convicts and descendants of convict stock. None the less this class forms already an inconsiderable proportion. It is probably no greater, if as great, as among the Americans at the outbreak of the Revolution.

The impartial story of immigration to the trans-Atlantic colonies in the seventeenth and eighteenth centuries is not congenial to our ancestral and material pride. Nine of the colonies were officially penal stations, to which about 2,000 convicts were sent annually for many years. From 1715 to 1765 more than 70,000 such persons were sent over, among them 10,000 from the Old Bailey alone. In 1787 Botany Bay was made a convict station, that it might in that capacity replace the then independent American States. It is estimated that today in the newly federated Commonwealth of Australia through the veins of three persons out of every seven flows convict blood. In Australia, as in America, what was evil among the early settlers has been largely absorbed in the virgin political soil. Among a new people only the brave and hardy qualities tend to perpetuate themselves and to endure. So is it and so will it be in Siberia. Adullam's Cave, first the rendezvous of outlaws, became the scene and source of heroism and accomplishment unsurpassed in the Bible.

In the "Awakening of the East," Pierre Leroy-Beaulieu gives a vivid picture of the various groups of present colonists at their nightly campings, the men unsaddling the horses, the women going to the springs and preparing food, the children playing, and some old man seated by the roadside reading the Bible to attentive listeners. The stock now peopling Siberia is that from which empires are made. Partially delivered from old traditions, equal in the democracy of labor, and forced to meet new conditions and new exigencies, Siberia is to solve political problems with which old European Russia is unable to grapple. The sun of political regeneration in the Russian Empire shines from the East.

WORLD ROUTES

The currents of history are prone to follow the beds of rivers, and commerce at first wanders along the roads which nature herself has marked out. Until four centuries ago the East and the West poured toward and across the Mediterranean to reach and benefit each other with the products of their agriculture and industry. The discovery of the Cape of Good Hope and the circumnavigation of Africa forced the abandonment of this ancient route, dealt the death blow to the princely cities of the Mediterranean, and centered the world's front in the British Islands and Holland. Now we are the amazed spectators of the beginning of that which is to make the world again change its base—commercial, political, strategic, and perhaps religious. Words can hardly exaggerate the momentous significance of the Trans-Siberian Railway, a work not yet completed, and the parts already in operation not yet beyond the initial, experimental stage. Even when its rails are at last in place and Vladivostok and Port Arthur are in full connection with St. Petersburg and Odessa, and the trains conveying passengers and freight begin to run with regularity and dis-

patch between the distant termini, the incalculable consequences of the vast enterprise will be only in their beginning. Every time the whistle of the locomotive blows, in its blast is the call not to resurrection—for in that northern Asiatic vastitude there is no dead past—but to the new, first birth of Siberia.

TRANS-SIBERIAN RAILWAY

In 1891 the first coupons were issued for the building of this railway. In December, 1892, the work was begun. A highway was to be pushed from St. Petersburg to the Pacific, a band of steel 5,852 miles long, binding the extremities of the empire and over its polished track affording an unrivalled route for the commingling of East and West and of their measureless products. From Paris to Vladivostok the journey by passenger and traffic was to be made in twelve days, and later on in ten. From Paris to Pekin in thirteen days, to Hongkong in seventeen days, diminishing the expense in money and in time by a third or a half.

This railroad was to be financiered, constructed, and administered not by private enterprise but by the state. Hence its object was not by financial returns to swell the revenues of giant corporations or individual capitalists. The profit and loss account on its pecuniary side was a minor consideration. Its single design and aim was to strengthen and develop the Russian Empire, and as an ultimate result to insure that empire the dominion of the East, the mastery of Asia.

THE RAILWAY A DETERMINING POLITICAL FACTOR

As the strategic position of Russia over against Asia is unique, so is this railroad unique in its possibilities. Whatever acquisitions Great Britain or Germany now holds, or may hereafter obtain on the Asiatic continent, those possessions are remote by thousands of miles from their base, and their efficiency depends upon a difficult and precarious connection through those thousand miles of sea and land. Nor can those possessions be brought into much more intimate relation with each other and with the home empire than they already are. That is, for Great Britain or Germany or any other power to devise a political or strategic rival to the Trans-Siberian Railway is an utter impossibility. It remains, and must remain, the most stupendous agent in determining the destiny of the globe that has yet been conceived by man. It is to be maintained, as it was first originated, under the most favorable geographic circumstances which a state has ever enjoyed for the accomplishment of a gigantic undertaking. There is no assertion here that as an achievement of engineering skill this railway surpasses or even equals a trans-American railroad from New York to San Francisco, or a trans-African railroad from Alexandria to the Cape. Viewed merely as a railroad, it may in every respect be inferior to either; its trains may be less commodious or less luxurious, its locomotives less powerful or less swift, its technical management less efficient or less sagacious; but, regarding simply geographic position, having in mind only where it runs, what it connects, and what it must inevitably effect, nowhere can experience or imagination suggest a rival. The nearest approach to rivalry would be afforded by some line crossing China from west to east. But the western terminus of such a line would of necessity be close upon Russian Siberia or Russian Turkestan; it would traverse only a moribund or disintegrating Asiatic state; and whatever might be the governing board of its construction and administration, it would indirectly, if not directly, be subject to Russian influence.

RUSSIAN POWER

The Russian Empire is the largest economic unit in the world, and disposes of a larger capital than any other corporation, all under the impulse of a single will. In Siberia more than one-third of the land—that is, more than 1,700,000 square miles—is the property of the government. To open up the fields, and utilize the rivers, and work the mines, and push the industries, and swell the armies, only men are needed, and we have seen how every possible facility and encouragement is afforded by the government to the desirable colonist. The supremacy of mind over the obstacles of nature is as yet far from complete. Though man can resist heat and cold better than any other animal, he is still profoundly affected by its extremes. Science, at the rate of five or six miles an hour, can drive the ironclad of 2,000 or even 10,000 tons through ice 8, 10, and 12 feet in thickness, and between the piled-up frozen walls open a path for commerce to follow in its wake. Each coming year is to see, as each recent year has seen, some new advance over barriers once deemed impassable, some new victory over obstacles once deemed invincible. What may not limitless resources effect when put at the disposal of profound sagacity and of absolute will!

Material advancement is by no means all nor is it the chief consideration. The whole Russian political system has been built upon the broad substructure of Slavic nature as that nature has been shaped by its geographic environment. However repugnant to every instinct of our American life that system may be, it is no creation of accident or arbitrary caprice, but of the inflexible circumstances that determined its form. In new conditions in the larger area and on an even vaster scale, it is again to be adjusted in the manner most congenial and most beneficial to the Slav.

A RUSSIAN MONROE DOCTRINE

In America we still cherish the Monroe Doctrine and regard it as an essential part of our international law. Russia's boundaries in Asia stretch for more than 4,000 miles along the frontiers of Asiatic states, and she is vitally affected by the conditions, by the disturbances and disorders existing in those states. In comparison, no other European nation is affected by them. By what might be called a Russian Monroe Doctrine, which would be as justifiable and as logical as our own, Russia might claim to be the sole guardian, and, in necessity, the sole arbiter of her Asiatic neighbors. Siberia and the Trans-Siberian Railway are in time to render such procedure a fact. Russia, not so much pursuing a definite Eastern policy as fitting in to the exigencies of her Eastern situation, has acted and still acts in the old hemisphere exactly as the United States have acted and still act in the new. She has simply conformed to the law of her being and to the logic of events. The "rectification of frontiers" to the advantage of the more powerful has been the course which the greater states without exception have followed from the beginning and will probably follow to the end of time. The continuous history of the United States and of Great Britain in particular debar those nations from drawing up indictment against Russian aggression in Manchuria or anywhere else. Maladministered by the Chinese as far as it has been administered at all, never an integral part of China proper, the already virtually accomplished absorption of Manchuria by Russia furthers the welfare and prosperity of that province and of the Eastern world.

RUSSIA AND THE EAST

The recent troubles in China present only an acute but temporary phase of the

patch between the distant termini, the incalculable consequences of the vast enterprise will be only in their beginning. Every time the whistle of the locomotive blows, in its blast is the call not to resurrection—for in that northern Asiatic vastitude there is no dead past—but to the new, first birth of Siberia.

TRANS-SIBERIAN RAILWAY

In 1891 the first coupons were issued for the building of this railway. In December, 1892, the work was begun. A highway was to be pushed from St. Petersburg to the Pacific, a band of steel 5,852 miles long, binding the extremities of the empire and over its polished track affording an unrivalled route for the commingling of East and West and of their measureless products. From Paris to Vladivostok the journey by passenger and traffic was to be made in twelve days, and later on in ten. From Paris to Pekin in thirteen days, to Hongkong in seventeen days, diminishing the expense in money and in time by a third or a half.

This railroad was to be financiered, constructed, and administered not by private enterprise but by the state. Hence its object was not by financial returns to swell the revenues of giant corporations or individual capitalists. The profit and loss account on its pecuniary side was a minor consideration. Its single design and aim was to strengthen and develop the Russian Empire, and as an ultimate result to insure that empire the dominion of the East, the mastery of Asia.

THE RAILWAY A DETERMINING POLITICAL FACTOR

As the strategic position of Russia over against Asia is unique, so is this railroad unique in its possibilities. Whatever acquisitions Great Britain or Germany now holds, or may hereafter obtain on the Asiatic continent, those possessions are remote by thousands of miles from their base, and their efficiency depends upon a difficult and precarious connection through those thousand miles of sea and land. Nor can those possessions be brought into much more intimate relation with each other and with the home empire than they already are. That is, for Great Britain or Germany or any other power to devise a political or strategic rival to the Trans-Siberian Railway is an utter impossibility. It remains, and must remain, the most stupendous agent in determining the destiny of the globe that has yet been conceived by man. It is to be maintained, as it was first originated, under the most favorable geographic circumstances which a state has ever enjoyed for the accomplishment of a gigantic undertaking. There is no assertion here that as an achievement of engineering skill this railway surpasses or even equals a trans-American railroad from New York to San Francisco, or a trans-African railroad from Alexandria to the Cape. Viewed merely as a railroad, it may in every respect be inferior to either; its trains may be less commodious or less luxurious, its locomotives less powerful or less swift, its technical management less efficient or less sagacious; but, regarding simply geographic position, having in mind only where it runs, what it connects, and what it must inevitably effect, nowhere can experience or imagination suggest a rival. The nearest approach to rivalry would be afforded by some line crossing China from west to east. But the western terminus of such a line would of necessity be close upon Russian Siberia or Russian Turkestan; it would traverse only a moribund or disintegrating Asiatic state; and whatever might be the governing board of its construction and administration, it would indirectly, if not directly, be subject to Russian influence.

RUSSIAN POWER

The Russian Empire is the largest economic unit in the world, and disposes of a larger capital than any other corporation, all under the impulse of a single will. In Siberia more than one-third of the land—that is, more than 1,700,000 square miles—is the property of the government. To open up the fields, and utilize the rivers, and work the mines, and push the industries, and swell the armies, only men are needed, and we have seen how every possible facility and encouragement is afforded by the government to the desirable colonist. The supremacy of mind over the obstacles of nature is as yet far from complete. Though man can resist heat and cold better than any other animal, he is still profoundly affected by its extremes. Science, at the rate of five or six miles an hour, can drive the ironclad of 2,000 or even 10,000 tons through ice 8, 10, and 12 feet in thickness, and between the piled-up frozen walls open a path for commerce to follow in its wake. Each coming year is to see, as each recent year has seen, some new advance over barriers once deemed impassable, some new victory over obstacles once deemed invincible. What may not limitless resources effect when put at the disposal of profound sagacity and of absolute will!

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RUSSIA AND THE EAST

The recent troubles in China present only an acute but temporary phase of the

greater Eastern question. The smaller Eastern question centers upon the Bosphorus, and is that wherein Constantinople and the Ottoman Empire are involved. Formerly it seemed to cover all the political sky. It is overshadowed today by the problem of surpassing magnitude still farther east. The factors in the greater Eastern question are various and many; yet there is one factor that dwarfs them all. It is Russia in her expanding, vivifying march across Siberia. With her, as with no other nation, goes what to the Oriental counts more even than armies, and that is prestige. Her only possible Asiatic antagonist is Japan; but the nature which thousands of years have inwrought cannot be radically changed by the signature of a parchment or by an act of the will. The Oriental kisses not the hand he loves the dearest, but the hand he fears the most. Despite the newly assumed garments of western civilization, the Japanese are Oriental to the core. The only European nation which can at all vie with Russia is Great Britain; but in such possible contest Russia would strike from near at hand and Great Britain from far away. Moreover, not only have Great Britain's hands been tied and her resources strained, but her military renown has, as the Oriental judges, been shattered in the South African war. Divergent interests and mutual jealousies prevent a combination of European powers under her leadership against Russia, such as she was able to accomplish against France in the Napoleonic wars. From the background of Siberia one figure stands forth distinct—the triumphant Slav!

GERMAN GEOGRAPHERS AND GERMAN GEOGRAPHY

BY MARTHA KRUG GENTHE, PH. D., ANN ARBOR, MICHIGAN

OF the countries that have taken an active part in the development of geographic knowledge Germany has always ranked among the foremost. The love of travel, of strange adventure, of tales true and tales false which touch the imagination, is innate in the Teutonic race. It made the northern Vikings discoverers of America long before Columbus; it unveiled to them the inhospitable coasts of Greenland and Iceland; it gave rise to the first known North Polar expedition—the expedition *in ultimam septentrionis axem* of 1140 A. D., of which Adam von Bremen has left us an account. Indeed, we may trace it down even to the recent travels of the heroes of discovery of the last century; for, unlike the explorers of most other nations, the German travelers were uninfluenced by political or economic motives. It is only within the last twenty years that Germany has begun to found colonies; yet it has not been the absence of the colonial spirit or blindness to the advantages of colonization which kept her in the rear. We know that when the New World was discovered German merchants, the Fuggers of Augsburg, then the chiefs of the East Indian commerce, were quick to grasp the possibilities of the situation, and founded branch establishments of their houses in Lisbon, and in the coffee and cocoa districts of South America; but the sad political conditions of the empire at that time put an early end to these aspirations, just as it did to the attempts

of the Great Elector one hundred years later to found colonies on the coast of Guinea; and so the era which laid the foundation of the naval and commercial power of all the states of western Europe proved to be the ruin of that of Germany, since the lines of trade which had enriched it were now forsaken and the new ones were for her unattainable.

But so strong was the vitality of the geographical spirit in Germany that even those sad times could not quite overcome it. If the nation could not help being cut off from the actual progress of discovery, it could partake in it mentally. The eyes of German observers followed the navigators and explorers to the unknown lands across the sea; they listened to the reports that came from there, and wrote them down and printed and propagated them, and it seems that through all the epoch of the discoveries books of voyage and travel were in no country read more eagerly than in Germany. Peddlers sold thousands of pamphlets dealing with true and false stories of the fabulous countries of the West, and German *Landsknechte* left their homes and sold their services to the Spaniard and the Portuguese in order to get there. One of these men, Ulrich Schmiedel, wrote an account of his American experiences which to this day is one of the most interesting sources for facts relating to the state of South America at the times of the conquest.

DAWN OF MODERN GEOGRAPHY

With this elementary interest another and a higher interest went hand in hand. From the standpoint of natural curiosity which delights in the strange unknown, attention soon passed to the examination of the facts related, to the putting together and comparing of the different reports, to the distinguishing of what was true or false, important or unimportant, to the arranging and classifying of the results obtained. Undisturbed by material and dynastic interests which in the conquering countries directed attention toward certain parts of the world, to the neglect of the rest, this quiet progress found in Germany the best conditions for development, and thus, while the *conquistadores* enriched their countries with gold and silver, the German geographers found treasures of another kind in discovering, or rather rediscovering, the scientific conception of the earth's face, the application to the enlarged cosmographical horizon of the scientific geographic methods of antiquity. In one word, they found the spirit of modern scientific geography. It was in Germany that the first globes and charts of the world were made, that in consequence of this a thorough reform of map-drawing and projection took place, that the idea of the atlas was first conceived and realized, that the first modern descriptions of the world, and the first systematic handbooks of general and physical geography were printed.

BEHAIM

The Bavarian, Johannes Müller, known better as Regiomontanus (after his native city, Königsberg in Franconia), first thought of constructing an earth's globe toward the end of the fifteenth century; the idea was carried out by one of his countrymen, Martin Behaim, of Nuremberg. Behaim, one of the few Germans who took an active part in the great discoveries, had accompanied Diego Cão on his voyage to the west coast of Africa in 1484–'85, and after his return made the famous globe still preserved in the "Germanische Museum" at Nuremberg, which has brought down to our days the image of how the world was conceived in the scientific mind immediately before the discovery of America, for the globe was finished in 1492, a few months before the arrival of Columbus at the land

of promise. We see on it distinctly the consequences of those errors of Toscanelli's chart, which made the Genoese estimate the distance much shorter than it really was, and thus encouraged their daring enterprise.

MERCATOR

In the line of map-drawing, Behaim, Regiomontanus, and others undertook a revision of the methods of projection. Gerhard Kaufmann, better known as Mercator, invented a new method specially adapted to the wants of charts of the world, which is still in use and bears his name as the well known Mercator projection. It was he, too, who after another German, Örtel, or Ortelius, had first united into a volume several maps belonging together, chose for such a collection the name of Atlas.

NAME AMERICA

I wonder whether all Americans are aware of the fact that even the name of their continent is due to none but a German scholar: In 1507 Martin Waldseemüller, also known as Hylacomylus, of St. Dié, in the Vosges, edited a book called *Cosmographiæ Introductio*, in which he gave a translation of Amerigo Vespucci's description of his voyages. That was just the time when Amerigo's fame filled the world, while Columbus' disgrace overshadowed his merit, and evidently his name had never reached the quiet village in the Vosges when Amerigo trumpeted forth his own glory. So Hylacomylus proposed that, since the new continent was, after all, not a part of the Indies, no name would suit it better than that of his famous explorer, Amerigo. The book was read far and wide, and so quickly was the proposition accepted that, when later on the true discoverer was known, the name was already rooted too deeply in general use to be abolished, and was even extended to the north part of the continent, while Hylacomylus had only meant it for Amerigo's special stage, the present South America.

EARLY GEOGRAPHIES

Another *Cosmographia* appeared in 1524, by Apianus (Bennewitz); the *Weltbuch* of Sebastian Frank, in 1534; in 1544 the fine *Cosmographia* of Sebastian Münster, and Merian's *Topographia* added to its descriptions the most beautiful engravings, which today still delight the eyes of the geographer as well as of the lover of art.

These works of descriptive character were followed by attempts at rational investigation. After Francis Bacon had first pointed to the relations of discovery and philosophy, philosophers had never quite lost sight of geography. The question of effects and causes thus came into it, the distinction of different kinds and classes of phenomena, and their division and subdivision into larger and smaller groups; the foundation of geographic systems, and with it the germ of the scientific study of geography. Cluverius' (Philipp Kluver, of Dantzic) *Introductiones in geographiam universam*, in 1629, was the first attempt in this line. In 1652 followed Varenius' (Bernhard Varen, of Hitzacker-on-the-Elbe) wonderful *Geographia Generalis*, in which we find the outlines of almost the whole domain of modern general geography, and in 1678 the learned Jesuit Athanasius Kircher published his *Mundus Subterraneus*, containing, among others, the first chart of the currents of the Atlantic Ocean, of a correctness which is marvelous considering the little knowledge of the time about ocean currents. Thus, though not materially connected with the great discoveries and conquests, Germany still held an honorable record among the fellow-nations, for hers was the intellectual and scientific conquest of the world which, when the others decayed and fell, remained as vigorous as before.

KANT

One of the most curious and admirable types of the learned German, who, though shut out from the world by forces stronger than he, yet with the eyes of the soul surveys and knows the whole world better than many others who have had all the advantages of voyage and travel, is Immanuel Kant, the philosopher of Königsberg. The work of this unique man in the development of geography, although through his whole life he never saw more than the environs of his native city, must never be forgotten. In his youth he was keenly interested in natural sciences, and through the reading of voyages and travels had acquired such a perfect knowledge of geography that during several semesters he gave lectures on physical geography and on anthropology, in addition to his philosophical lectures, and great was his renown also as an authority in nature problems. His most wonderful work in this line, however, equal to the *Critique of Pure Reason*, is the *Allgemeine Naturgeschichte und Theorie des Himmels* (General natural history and theory of the heavens), in which, forty years before Laplace, he exposed the formation of the earth and the solar system out of a rotating ball of gas, as it is now accepted. By a singular mischance the manuscript was lost at the printer's, and we know of it only through one of Kant's later works, in which he gives a sketch of this theory. Thus the great French mathematician could formulate the theory again and enjoy the glory of being the discoverer of the Nebular Hypothesis, which he well deserves, as he did not know Kant's book; but later times have rightly given this theory the name of the "Kant-Laplace Hypothesis."

HUMBOLDT

Like Kant, many of the leading German scientists of his time were attracted to geography. We may name here the brothers Forster—Georg, author of *Ansichten vom Niederrhein*, and Johann Reinhold, the companion of Cook on his voyages—Leopold von Buch, the geologist, whose *Voyage to Lappland* is one of the finest specimens of geographical literature, and, above all, the great naturalist, traveler, and geographer, Alexander von Humboldt, the scientific discoverer of the Equinoctial Regions of the New Continent. In a course of lectures which he gave in later years at Berlin and worked out afterward into one of his finest books, *Kosmos*, or Outlines of a Physical Description of the World, he delineated the subjects and ends of geography in a most remarkable way. To him the thought first presented itself that besides the different departments of the special natural sciences, there was need of a general one which might bring the isolated facts of the others together and trace out of them the general features of the globe, or, as he expresses it, "consider the results of scientific research in its vast relations to mankind," and "recognize in the struggles of the elements that which is produced by a certain order or law." By this he ought not to be understood as wanting in a philosopher's way to derive the science of the earth by abstract theories from some fundamental principles; not at all. His geography, namely, description of the earth, was "the thoughtful observation of the empirical phenomena," and he repeats over and over again that "without a serious inclination for the knowledge of details every large and generalizing conception of the world would be nothing but a deceitful mirage," but that "the details of natural discovery possess an innate force of mutual fertilization." Thus "the unity of a physical description of the world is no other but that which is found also in the study of history." Both geography and history stand on the same empirical foundation, but the

thoughtful observation of natural phenomena, as well as of historical facts, must necessarily lead to the recognition of an old inner law dominating under the perpetual changes of material and intellectual forces. The geography of plants or of animals is then as different from descriptive botany and zoölogy as the geological knowledge of the earth is from mineralogy. His physical description of the world is therefore "not to be confounded with a so-called cyclopedia of natural sciences." In it details are only studied in their relation to the whole, as parts of the world's phenomena, and the higher this point of view the more this doctrine will become capable of individual treatment and enlivening report.

RITTER

By the side of Humboldt we meet with another man who, after Kant had explained the genesis of the earth and Humboldt had defined the basis of the scientific examination of its physical conditions, took up the question of man's influence upon and relation to geographical problems: it was Karl Ritter, in his *Erdkunde im Verhältniss zur Natur und Geschichte des Menschen* (Geography in relation to the nature and history of man). We notice at once that a change in the meaning of the word geography has here taken place. Hitherto geography, according to the composition of the Greek root, had always been translated as "Erd- (or Welt-) beschreibung" (description of the earth or world), but it is now called "Erdkunde," a name which may be rendered only approximately by "knowledge of the earth." What Ritter wants to express by the choice of the name is that geography, whether physical or political, is not a descriptive discipline, as thus it would not deserve the name of a science, but a subject full of problems worthy of the most exact scientific and philosophic discrimination. It not only imposes on the student a multitude of facts to be remembered, but introduces him into the secret laws ruling the natural and political history of the world, the precise recognition of which, of their influence on the development of nature and of man, is the object of geographical studies, without regard to practical and commercial purposes. In the introduction to his *Allgemeine Erdkunde* Ritter says: "This geography (Erdkunde) is called general, not because it intends to give everything, but because it investigates with *equal* attention and *without consideration of any special ends* the characteristics of every part of the earth and every one of its forms, whether it lie in the ocean or on the land, on a far-away continent or in our own country, or be the seat of a cultivated nation or a desert." These words form a milestone in the development of modern geography. They express for the first time unmistakably the program of the so-called comparative geography, which would be sorely misunderstood if it was thought a method consisting principally of questions like those found in so many text-books, "Compare such and such city, river, boundary," which is only a more interesting way to better remember certain facts. Such exercises are only the rude framework of real comparative geography. We may say that all comparative geography includes a certain amount of comparison, but that any geographical comparison does not represent comparative geography.

The results of such elementary comparison are the very beginning of comparative geography. After having obtained them, the real comparative work only sets in with inquiring after the different causes which produce them and the different effects which they produce. Then only we shall be able to actually compare the character of different parts of the globe, and dare to say that we know them. Of what value is

it to know the different numbers which represent the population of two states without knowing to what they are due? You may reply, "The principal thing is to know the facts. The farmer and the merchant little care for causes, provided that they know where to find the largest number of customers." Such an answer would be that of a tradesman, not of a scientist. Moreover, even the business man might gain by studying the causes of the variations of the market. Now, if such advantage is gained by this method even for practical interests, must it not be of far greater consequence for pure science? For science does not confine itself to the wants of the day; it pays equal attention to all the various problems, and thus, of course, obtains far more general and more trustworthy results. It was this question that Ritter first took up most energetically. That which makes geography a science, and penetrates the work of Humboldt as it did that of Varenius, shines out with perfect precision, in the words of Ritter, "without consideration of any special ends."

PURPOSE OF GEOGRAPHY

He who studies or teaches geography merely to acquire such a knowledge of geographical facts as is needed for traveling, or for the reading of newspapers, or for business enterprise, resembles the jeweler who knows all the qualities of the precious stones in his store. He is as little a geographer as you would call such a jeweler a mineralogist; but as surely as there is a way of knowing stones which constitutes a science called mineralogy, is there a way of knowing rivers, mountains, and dwelling-places which deserves the name of scientific geography. It is the way in which the study is carried on that makes the difference. Geography has its value in itself, and must be studied through itself, and for the sake of itself, not for secondary purposes. If practical advantage is also gained out of it, so much the better; but it is not the leading purpose.

GERMAN ACTIVITY IN GEOGRAPHY

This is the Credo of German geography, as represented at twenty universities, many of which possess quite a staff of professors, ordinary and extraordinary, private docents, and assistants in geography, together with a complete geographical apparatus of books, periodicals, maps, globes, pictures, photographs, lantern-slides, and the so-called "Geographisches Seminar" or institute, where practical courses are also given. In a territory considerably less than that of Texas, Germany has more than twenty geographical societies, who do valuable work in local or general geography, and send out travelers by means of special funds. They publish scientific reports every year, and besides these a dozen geographic periodicals are published by divers editors, some of which are only equaled by the publications of the Royal Geographical Society of London. Geography is taught not only in primary schools, but in the "Gymnasium" and high schools for from five to seven years, and there is now an agitation to give it a still wider extent in these schools, and to have it taught from beginning to end by teachers specially trained in the subject at the university; for geography is in the university studies a subject in which one can obtain a Ph. D. degree after three or more years' study on the university plan, and by the presentation of a thesis on a geographical subject which contains positive results of original scientific research. This is the present state of the movement started by Karl Ritter and his school.

BERGHAUS

The pioneer of the new ideas was Heinrich Berghaus, Humboldt's friend,

who in his *Länder und Völkerkunde* gave the first text-book, or rather hand-book, composed after the new principles; but more important than this is his Physical Atlas, which down to our times has held a fundamental and leading position in physical geography, and only recently has been imitated in an enlarged size by the great physical atlas which is now being published in London. After Berghaus, Oscar Peschel became the head and the soul of geographic progress. During more than twenty-five years he edited one of the best geographic periodicals, the *Ausland*, and his books on Physical Geography, New Problems of Comparative Geography, Ethnology, History of Geography, History of the Age of the Discoveries, though partly supplanted by more recent publications, belong to this class of scientific literature.

RICHTHOFEN

A new epoch was opened by Ferdinand von Richthofen, the explorer of China and Peschel's successor in the chair of geography at the University of Leipzig. The address which he gave at his inauguration in 1883, *Uber Aufgaben und Methoden der heutigen Geographie* (On the problems and methods of modern geography), became the program of modern geographers, and was indeed the first critical and systematic survey of the whole domain of geography. The program has been changed since in details, as all science undergoes constant change and evolution, but it rests to this day upon the foundation he presented.

In this treatise Richthofen first defines the limits of geography, giving as its special field of research the surface of the earth. Various are the phenomena which it offers, and which have been studied by various sciences; but geographical work begins with the problem of location of the different phenomena, with the question, Where? The surface of the earth may be conceived in a double way: as a mathematical or a material surface. In the former meaning the geographer's work consists in measuring the earth's extent, which will lead him to define and to represent the relief on maps, and to subordinate the different results of his work to inherent laws, which will build up the morphological side of geography. Then this surface is also subject to cosmological influences; their investigation will need the assistance of astronomy and mathematics, and is called astronomical or mathematical geography. The material surface is composed of different substances, classed in three grand divisions — atmosphere, hydrosphere, and lithosphere—each of which consists of various components in various proportions at various times; geography must find out the local relations of the multiple problems and phenomena arising from these combinations. To this end it needs the assistance of meteorology, hydrology, and geology, without being itself one of these sciences, since it cares for them only for the sake of the consequences which their phenomena produce in the configuration of the surface. This is physical geography.

But the earth's surface is not a rigid one. It is constantly undergoing changes which arise from the different forms of life existing on it, and this obliges the geographer to also take the forms of life in consideration. For this he needs the assistance of botany and zoölogy, which again furnish him their facts in order that he may study in them the influence of location, of height, latitude, continental and marine surroundings, etc. These branches of geography are zoögraphy and phytogeography.

At last we must consider the influence of man on all the preceding phenomena, and their influence on him. For this purpose the geographer must consult history, statistics, sociology, ethnology, and anthropology. Out of these investi-

gations he establishes the last great subdivision—anthropogeography.

It is impossible in this short review to enter into more than the outlines of this vast program; but even these show that we have to deal here with the foundation of all geographic work of the last fifteen years. From this time we must reckon the wonderful development of recent geographic investigation in Germany, represented not only by the name of Richthofen, but by the names of Penck, Suess, Richter, Brückner, Supan, Günther, Gerland, Drygalsky, Hettner, Phillipson, and others.

It was natural that, Richthofen himself having entered the field of geography from the geologic side, those branches of geography which are most closely connected with geology should have been most cultivated by him and his followers. Thus it happened that those geographic questions which are related to natural science received most of the advantage of the new impulse, namely, the problems of physical geography. It even seemed for some time as if the idea of scientific geography would be only applied to this division, as if geography was nothing but a subdivision of natural science. This opinion was even held by a party of the geographers themselves; but now, with the exception of a very small minority, of which Professor Gerland, at Strassburg, is the most important representative, it may be looked upon as a past epoch in geographic evolution. Valuable as the study of physical geography is, it cannot be denied that it is only a part of geography, not geography itself, and that the topic most alive in public interest, the question of human life, work, and influence upon the earth's surface, the so-called political geography, is just as indispensable. The study of physical geography alone would deal with the earth as a dead planet, a planet without life or history.

This disproportion between the progress of physical and the backwardness of political geography was naturally felt most sorely in schools, which would make the former a very interesting branch of teaching, while there was no way of learning the latter except by learning single facts by heart, since the knowledge of these facts was indispensable after all. For "no physical or geological wisdom," said then Professor Kirchhoff, of Halle, one of the foremost men in the progress of school methods, "will help him who does not know whether Madrid lies in Spain and Petersburg in Russia, or vice versa." Thus necessity led geographers back quite naturally from the overemphasis of physical geography to the further pursuit of Ritter's ways. It was recognized that such an important branch of instruction must needs have a scientific foundation, and that if this foundation had not yet been discovered, the reason might be that the right point of view had not yet been taken.

RATZEL

This point of view was found and Ritter's method taken up again with the improvements of modern science by Friedrich Ratzel, Richthofen's successor in the Leipzig chair of geography. We are reminded of Humboldt's remarks on the spirit of physical geography when we read Ratzel's words: "The complaints of the dryness of political geography, as old as geographic instruction itself, are heard again and again in our times. They seem to be the result of lack in pedagogic skill; but the fault lies deeper, it lies in the scientific treatment of political geography. For this is the cause of all the difficulties in this branch of instruction, that the facts of political geography still lie much too rigidly beside each other and beside those of physical geography. The instruction in this important branch will never be rendered interesting unless the

material is cleared up by classification and refined by investigations, paying special attention to comparison and evolution." (Preface to the *Political Geography*.)

The first attempt in this direction was the *Anthropogeography* (Munich, 1882), or *Outlines of the Application of Geography to History*. Although the book was not spared opposition from the first, it started a new epoch in geographic research, and after various special works on the same subject, a second volume followed several years later. In 1896 a treatise, *Der Staat und sein Boden*, published in the Proceedings of the Royal Saxon Academy of Sciences, gave the problem a still closer connection with political questions, and in 1897 the author published a new standard work, containing the application of the scientific method to the very political geography which had so long been only a list of names and numbers, the *Politische Geographie*. The word political in this title stands for more than a mere nomination; the aim of the book is to define the close connection of politics and geography in a manner which makes it valuable equally for the statesman and for the geographer. The author hopes it may give the former a better understanding of geographical, the latter of political, influences in his sphere of interest, and thus awake, not only in teachers, but in all his readers, of whatever condition, what he calls "geographischen Sinn," geographical feeling, just as we speak of acquiring the feeling for a language in philological studies. To him, states are organisms in various stages of development, and they are made geographic organisms by being most closely bound to the soil on which they develop, penetrating deeper and deeper into its resources. As such geographic phenomena they can be observed, described, measured, drawn, compared like every other phenomenon of life on the earth. The mistake of former political and sociological theories was that they dealt with a too theoretical conception of the state—a state, as it were, which stands in the air, and which owns the soil as a kind of large property. But we must put that airy state on the solid foundation of the earth, and then we shall get a living conception of the political side of geography. According to this programme, the author deals in nine chapters with the following topics: The State and its Soil; the Historical Movement and the Growth of States; Fundamental Laws of the Increase of the Area of the State; Situation; Area; Boundaries; Land and Sea; the World of the Water; Mountains and Plains. He presented one year later the application of his principles in the little book entitled *Deutschland*, which every one who wishes to obtain an idea of modern German geography should read.

WHAT IS GEOGRAPHY?

Geography, then, as carried on in Germany, is a field of manifold studies. It requires the knowledge of mathematical and physical geography, including map-drawing and surveying, oceanography, climatology, geography of plants and animals, anthropogeography, political, and commercial geography, history of geography, together with a general acquaintance with the cognate sciences, such as geology, physics, ethnology, history, political economy, and philosophy, and also, if possible, with botany, zoölogy, and anthropology; but even this would not yet make a geographer. We must remember Humboldt's words, that geography is not "a so-called cyclopedia of natural sciences," and that from the knowledge which the sciences impart we must always proceed to the consideration of the whole. The whole, as shown in Ratzel's *Deutschland* and a number of similar publications, consists in the application of this general knowl-

edge to a certain region of the surface of the earth, the so-called "Länderkunde" of German geography, which is no longer a mere description of the different countries, but a scientific investigation of their characteristics. It is quite significant that no other language has an exact synonym of this denomination, a fact which more than anything else shows that it is a German specialty of entirely German origin. The "Länderkunde," so often called very inadequately "descriptive geography," is represented at German universities, as well as general and systematic geography. Every professor will, beside these courses, devote a large part of his time to a single country or continent, which always is the most interesting part of the whole study.

ELEMENTARY TEACHING

In school geography "Länderkunde" is of course the dominant subject, to which all general geography has only a subordinate and tributary relation; for to children's eyes we must never present the dry and, to them, sterile facts of systematic knowledge. It is applied science which fits a child's understanding and rouses his interest. If we want children to pay attention to effects and causes we must let them see things and incidents in which they operate, give them a picture of concrete life, not abstract reflection. Now, in order to thus embody the principles of geography, no better means can be found than "Länderkunde." A course in geography that opens with a definition of geography and of the primary notions of the geographic vocabulary, and which gives an introductory course on the principal subjects of general physical geography before taking up the study of a definite part of the earth, would not only be very unpsychological, but do also the greatest harm to geography itself. For to the young learner who has to put such generalizations into his brains without enough knowledge of details to make him feel their general truth geography will appear nothing but a complexity of phrases to be learned by heart, and this preconception will cause him to look at all the following geographic data from a wrong position; all the special facts will be received by him only as illustrations of the preceding principles, just as formerly in the teaching of languages the spoken language appeared only as a collection of examples to apply grammatical rules; but this was putting the cart before the horse. This same mistake has often made geography a very dull subject, while it can be one of the most interesting, even for young minds. The secret of a successful teacher of geography, as of languages, is to give the pupil a whole and living unit, of which his imagination may get hold, and to present the unit so that he will feel the leading principles before he has learned them separately. Thus their necessity impresses itself upon his mind spontaneously, instead of being demonstrated to him as a scientific Credo.

In such a course it is then not permitted to treat a continent or a state or another district first, physically and afterward, perhaps a year later, politically, or even, as I have seen in textbooks, first politically and then physically, or to treat the subject by classifying the details under special headings, as relief, watershed, productions, dwelling-places, etc., through which the causal connections are inevitably torn asunder. Instead of this the teacher will, after a short general survey of the whole, divide it up into a number of smaller units or natural regions, within which he will treat the different topics and their mutual influences upon each other. He will make, as it were, a horizontal section through the vertical columns of the topics named above, and work out the picture given by each of these sections as an individual subject and in its rela-

tions to its neighbors. After this a short historical sketch, with sufficient reference to the geographic conditions of the historical development, will furnish the basis for an examination of the political contours of the map, in which much repetition of the preceding lessons will come in. Reciting the geographic facts according to special topics may be used as a means of repetition, as a help to the pure memory of names, but even then must never be done without always pointing out on the map the location of the places mentioned. It is, however, absolutely to be condemned as a part of the lesson, because it kills the geographic feeling.

The first country studied in this way is, of course, the native country, especially the home of the child and its environs. This home geography fills the first year and gives opportunity to make the child acquainted with the preliminaries of general geography, not in a systematic, but in an inductive way, and to introduce it to the thoughtful use of the map. Map-reading may be carried on to a very high degree of perfection, and even furnish positive knowledge of phenomena which cannot be studied in nature, if map-drawing for school purposes is done with such perfection as in Germany, where the principle that for children the best things are just good enough has exercised a wonderful influence also in this direction. The cartographic productions of Debes (Leipzig), Perthes (Gotha), and Reimer (Berlin) have no peer in any country. In a German geography class, therefore, you can observe that the teacher really gets his pupils to read the cartographic representations like letters in a book, to use the map as a directory in walking, to find their way easily in unknown places by the aid of the map, and perhaps we have here one of the reasons why Germany more than any other country is the home of pedestrian trips and of travelers' guide-books.

In the second year follows the study of Germany, after this a general survey of the globe and continents, then the special study of Europe and of the foreign continents. It is not until then that the systematic teaching of general physical geography begins, which is now indeed nothing but the repeating, putting together, completing, and systematizing of what the pupils have already learned in the former grades in an occasional and inductive way. Part of the schools make this the final course; others take after it a second and more advanced course of the geography of Germany, with special attention to political, social, economic, commercial, and colonial problems, for which mature pupils are better fitted than the children of the first German course. Thus on leaving school they have a clear idea of the actual state and conditions of the country in whose life they are to participate. On the whole, the average German who does not pursue higher studies will have from seven to nine years of geography, with generally two hours a week for 40 weeks each year. This makes about 550 to 700 lessons in the whole course, or 17 per cent of all the instruction imparted outside the university.

WHY STUDY GEOGRAPHY?

It seems proper to ask why German educators lay so much stress on geographic training. What is the value of a thorough study of geography for education and for life?

There are, of course, a number of practical reasons. The knowledge of many geographic facts is so necessary for everybody that even when no higher merit had yet been found in it, the study of geography was included at least in the schedule of primary schools.

As to scientific geography, the question has often seemed not very easy to answer. It has been objected that if

geography comprised all the various branches named above, it could hardly be called a science, but was rather an agglomeration of fragmentary knowledge borrowed from a dozen other sciences, the study of which was an impossibility even for a first-rate intelligence, and must needs lead to a kind of half knowledge of everything which was the very contrary of scientific work. It has been one of the most serious tasks of geographers to refute this objection which has been repeated most obstinately over and over again, as it arises from an entire misunderstanding of the geographical spirit. In the first place, there is no science now known in which one mind can have an equally complete command of all the subdivisions; even the greatest men in medicine, zoölogy, history, etc., are specialists in some definitely limited area, while they merely keep up with the scientific progress of the rest and leave other specialists to do other special work. Yet nobody will accuse them of superficiality. Why should not the geographer enjoy the same privilege? But even if it were possible for one man to have a perfect and up-to-date knowledge of all knowledge connected with geography, that would not make him a geographer. Geography is not a "cyclopedia" of all the enumerated sciences. That is the point where erroneous judgments on geography generally start. It is not the number and character of the facts which constitute geography, but the ways and methods in which they are studied. This is what makes the geographic spirit and what gives geography the character of a separate science apart from all the others, however closely connected with them in many points.

Thus, for example, the physicist may study, describe, and explain the deviation of the compass or the differences of temperature of the atmosphere; but the geographer (Humboldt) will locate on the map the points of observations and connect equal observations by lines, and from the arrangement of these lines draw conclusions as to the influence of magnetism or temperature upon the surface of the earth; or the statesman will draw and claim boundaries for the state which he represents for such and such reasons; the geographer will look at and compare the boundaries of the states in different parts of the world, find out the laws active in their formation, tell us why certain boundaries have always been objects of contention while others never were disputed, and explain the present boundaries, their origin, and their importance for the life of the nations (Ratzel); or the geologist will study and explain the different strata of the earth's crust; the geographer (Brückner) will examine their distribution over the surface of the globe, compare it with the present arrangement of mountain ranges, and explain out of the geologic past the features of the geographic present. In whatever problem the geographer may be interested, the object of his investigation must be connected with the earth, the earth's surface as a whole and as the primary unit. However interesting may be the object of his special research, he cannot allow himself to be entirely confined to it without ceasing to be a geographer.

POINT OF VIEW

The poet Jean Paul says: "There are two ways of enjoying the world. One is to lie down in the grass, look at the green stalks and pretty flowers about you, watch the humming insects, and thus fondly take in all the wonderful revelations of life which present themselves in this seclusion. The other is to rise up high in the air like a bird, so high that all the little and mean things vanish from your view, and you only behold the whole of the great, wonderful creation beneath you."

In geography both methods are combined. By the peculiar character of its

procedure, which requires a scrupulous examination of the detail, together with a wide survey of generality, it exchanges constantly the small circle of special research and the wide field of generalization. Must not such a change between restriction and expansion be most helpful? It is a fact that the type of the learned specialist who is almost a stranger to the problems beyond the limits of his own work is in no field so rare, if not so totally absent, as in geography. The broadest-minded people of the fine staff of German scientists, the most alive to the interests of the world about them, are met with among the professors of geography. Geography forces its apostles to keep constantly apace with all the progress around them. In no other field of study would the neglect of almost any question of the day, scientific or not, prove more fatal than here. The introduction of the study of geography into the universities, therefore, is a powerful ally to keep the students from becoming narrow in their views, from looking no further than the small circle within which the axis of their own special interests rotates. It will make them tolerant by teaching them to understand different conditions, and to make allowance for different consequences arising from these different conditions. It will make them wise and successful in contact with political questions, because they will not expect nor exact from foreign nations more than they can afford, according to their actual state and circumstances.

UTILITY OF GEOGRAPHY

Geography, more than almost any other science, has the power to enrich the lives of those who devote themselves to its study. The botanist may teach you the secrets of the life of trees and plants, the zoölogist introduce you into the interesting ways and habits of many a little fellow-creature, the geologist open your eyes for the charms of tracing the history of the soil which you tread, but none gives you such an entire and satisfactory feeling of nature as geography. It is the entirety of the impression upon which stress ought to be laid. The natural disposition of the average mind goes to the whole. Even a good botanist or other scientist will be specially interested only in part of what surrounds him, be it plants or animals or stones, sometimes even only in a certain class or family of them. Geography teaches you to enjoy nature as a whole. It tells you why the soft lines of this mountain range, covered with dark firs, slope so gently down to the valley, while yonder ice-capped summits tower up steep and bold to the sky. It shows you why here waving cornfields reward the farmer's labor, and why another region seems to be one enormous meadow.

Geography will contribute, too, to improve the character and adorn the life of the student. It will make him feel familiar and at home on almost every spot of the earth; nowhere will he stand criticising and complaining of what is different from his native place, but appreciate the differences of nationality, and instead of repining for what cannot be changed, come home enriched by the touch of many a string in his heart which would never have resounded under other circumstances. In the character of the German nation we see this side highly developed, too highly even from certain points of view. The readiness with which the German adopts foreign customs when he goes abroad, as well as when they are brought to him, the facility with which as an immigrant he accommodates himself to the conditions of his new home is in great measure due to his highly developed feeling of geographic equity. A reasonable portion of it added to national character would be an improvement for many races.

Political geography, especially, must

not be forgotten when we deal with the advantages of geography. Much information of high value is offered through it to the student. Economic and social problems, questions of government and constitution, which when treated in an abstract and theoretical way will often fall short of the understanding, as well as of the interest of young brains, find here wonderful material for exemplification, object-lessons in public life, politics, economy, and sociology. Enormous treasures lie hidden here, waiting only for the right digger to discover them. In a country where interest in public affairs is so strong as in this great Republic, this duty of the schools should be cherished most conscientiously. Geography should be given the place which it deserves, not only in elementary instruction, but also in all high schools and universities.

THE DRIFT OF FLOATING BOTTLES IN THE PACIFIC OCEAN

By James Page, U. S. Hydrographic Office

AMONG the various investigations carried on by the U. S. Hydrographic Office, there is one which has always excited greater or less popular interest, owing probably to the fact that it lies within the power of any one who is at sea, and who is likewise gifted with a reasonable amount of curiosity and the leisure time to gratify it, to contribute toward the end in view. This particular field of research is the investigation of the surface currents of the sea by means of the knowledge obtained through the drift of floating bottles, or, as it is familiarly known, the drift of bottle papers. The apparatus required is not extensive. The date, the latitude, and the longitude of the vessel at any given time are written upon a piece of paper; this paper is then placed in an empty bottle of whatever character is nearest to hand; the bottle is then corked and sealed and cast into the sea. After the lapse of time, sometimes of years, certain of these bottles find their way to the coasts of the adjacent continents or islands, and the papers contained in them ultimately reach the U. S. Hydrographic Office.

The office assists in the investigation to the extent of furnishing the pieces of paper. These are prepared in blocks, and are distributed free of charge to the masters of vessels who promise to undertake the task of casting them adrift—a promise which, the results prove, is rarely violated. The paper is printed in seven languages in order that it may be readily understood, no matter upon what coast it ultimately lands. The first part, which is to be filled in by the person who casts it adrift, contains a space for the name of that person, for the name of the vessel, the date, the latitude, and the longitude; the second part, which is to be filled in by the discoverer of the bottle, a space for the name of the finder, the date, and the locality in which it is found. At the bottom of the paper the finder is instructed, in seven languages, to return the paper to the U. S. Hydrographic Office.

Several hundred of these papers find their way back each year, the great majority of those which are returned having been cast adrift in the Atlantic Ocean, and charts have from year to year appeared showing the drift of bot-

tles in that ocean. These charts all unite in showing a steady easterly drift in the temperate latitudes of both the North and the South Atlantic, and an equally steady westerly drift in the tropical latitudes, the generalized current system of either ocean thus consisting of a vast eddy about some central point, the direction of the circulation being anti-cyclonic in either hemisphere—*i. e.*, with the diurnal motion of the sun, as observed in that hemisphere, just as in the case of the prevailing winds.

Taken collectively, the lines of drift of floating bottles in the Pacific again show, precisely as in the case of the Atlantic Ocean, that the general direction of the drift is eastward in the higher latitudes, westward in the lower. At least this is so for the North Pacific. For the South Pacific evidence of the eastward motion of the extratropical waters is lacking. None of the drifts reveal the existence of the equatorial counter-current flowing eastward between the westward-moving equatorial currents of the southern and northern hemispheres. The average velocity of the easterly drifts is 4.4 miles per day, of the westerly drift 10 miles per day, or more than twice as great, which is again in accordance with the results for the Atlantic Ocean. The highest velocity attained was that of a bottle thrown overboard from the steamer *Warrimoo* January 23, 1897, in latitude 4° N., 168° W., and found March 6, 1897, on one of the Gilbert Islands, having drifted 1,100 miles in 42 days, or at an average rate of 26 miles per day. None of these velocities makes any allowance for the time during which the bottle may have lain undiscovered on the beach. The longest drift was that of a bottle which was thrown overboard near Cape Horn June 18, 1896, and found near Cape York, on the northern coast of Queensland, Australia, after the lapse of nearly three years. The shortest practicable route which it could have pursued measures 10,100 miles in length, or nearly two-thirds of the total distance around the earth in the latitude of its path, giving an average velocity of 10.1 miles per day. The actual distance traversed was probably much greater than this.

My main object in directing attention to these drifts is to suggest the idea that they illustrate an apparent paradox. The bottles themselves float upon the surface, but if I were asked whether the lines drawn upon a chart to show their course represented the surface currents of the sea, the currents with which the navigator has to deal, I should say *emphatically no*. The actual surface currents present no such uniformity, either in direction or velocity. As an example of this, take the currents actually observed in the five-degree square of the North Atlantic Ocean bounded by the parallels 35 to 40 degrees north and the meridians 65 to 70 degrees west (off the coast from Hatteras to Sandy Hook), in the heart, therefore, of what is ordinarily known as the Gulf Stream, concerning which the popular impression is that it flows along steadily like a mighty river. For any given month, say September, the currents actually observed within this square were as follows:

Setting northeast, 32 per cent of the whole number of observations ranging from 6 to 70 miles in 24 hours.

Setting southeast, 23 per cent of the whole number of observations ranging from 8 to 65 miles in 24 hours.

Setting southwest, 27 per cent of the whole number of observations ranging from 6 to 76 miles in 24 hours.

Setting northwest, 18 per cent of the whole number of observations ranging from 9 to 63 miles in 24 hours.

Evidently here there is none of the uniformity presented by the drifts and which the mind ordinarily associates with the Gulf Stream.

To get at the true meaning of these lines of drift beyond the fact that they represent the resultant of the traverse

line pursued by the bottle in its journey, it is necessary to go back to the motive power which gives rise to the surface currents of the sea, viz., the winds. A perfectly steady wind acting continuously on the surface of the sea will, through friction, give rise to a movement of the surface waters in the same direction as the wind itself. If the latter continues for a sufficient length of time the impulse, first felt only at the surface, will gradually communicate itself downward, owing to the viscosity of the water, and the lower strata to a successively greater and greater depth will thus partake of the movement until it is finally shared by the whole mass, the velocity of the motion diminishing as the depth increases. The rate, however, at which this motion is communicated to the depths of the ocean is exceedingly slow. It has, for instance, been estimated that in a depth of 2,000 fathoms a surface current of given velocity would require a period of 200,000 years to transmit its due proportion of this velocity to a point halfway toward the bottom. Similarly, when once established, these submarine currents exhibit a corresponding reluctance to undergo any variation in direction or intensity.*

Perfectly steady winds, however, do not exist, even in the region of the trades. The winds are constantly changing, and the surface currents change with them. The lower strata of the ocean, however, are insensible to these changes, and at a considerable distance below the surface the waters of the ocean have probably a slow but perfectly uniform motion, the direction of the motion probably agreeing closely with that of the resultant surface winds.

We have, therefore, in the body of the sea two distinct sets of currents; first, those at the immediate surface, which move practically at the obedience of the surface winds, sometimes in one direction, sometimes in another: second, those of the lower strata, which are constant in direction and velocity and represent the aggregate effect of the winds that have blown for ages past, the sea in this respect furnishing a close analogy to the atmosphere, the motion of the lower strata of which is constantly disturbed, while that of the higher strata, as shown by the motion of the cirrus clouds, is comparatively uniform.

It is the motion of these lower strata, as I take it, that the uniform paths pursued by these drifting bottles to some extent represent, and it is the evidence contained in them that should be studied in investigations dealing with the currents of the ocean in their entirety, rather than the evidence obtained from any given set of current measurements made at or near the surface and for some given point.

* Zöpprits, Annalen d. Hydrographie, 1878.

THE BRITISH ANTARCTIC EXPEDITION

THE *Discovery*, carrying the British National Antarctic expedition, is now well on her way to South Polar regions. The proposed work of the party has been carefully outlined by the presidents of the Royal Society and of the Royal Geographical Society in their instructions to Captain Scott and to Dr. George Murray, the scientific director. The instructions to the commander are as follows:

1. The Royal Society and the Royal Geographical Society, with the assistance of His Majesty's Government, have fitted out an expedition for scientific discovery and exploration in the Antarctic

regions, and have entrusted you with the command.

2. The objects of the expedition are: (*a*) to determine, as far as possible, the nature, condition, and extent of that portion of the South Polar lands which is included in the scope of your expedition, and (*b*) to make a magnetic survey in the southern regions to the south of the 40th parallel, and to carry on meteorological, oceanographic, geological, biological, and physical investigations and researches. Neither of these objects is to be sacrificed to the other.

3. The scientific work of the executive officers of the ship will be under your immediate control, and will include magnetic and meteorological observations, astronomical observations, surveying and charting, and sounding operations.

4. Associated with you, but under your command, there will be a civilian scientific staff, with a director at their head. A copy of his instructions accompanies these instructions to you.

5. In all questions connected with the scientific conduct of the expedition you will, as a matter of course, consider the director as your colleague, and on all these matters you will observe such consideration in respect to his wishes and suggestions as may be consistent with a due regard to the instructions under which you are acting, to the safe navigation of the ship, and to the comfort, health, discipline, and efficiency of all under your command. Those friendly relations and unreserved communications should be maintained between you which will tend so materially to the success of an expedition from which so many important results are looked for.

6. As the scientific objects of the expedition are manifold, some of them will come under the immediate supervision of the director and his staff; others will depend for their success on the joint coöperation of the naval and civil elements, while some will demand the undivided attention of yourself and your officers. Upon the harmonious working and hearty coöperation of all must depend the result of the expedition as a whole.

7. The expedition will be supplied with a complete set of magnetic instruments, both for observations at sea and on shore. Instructions for their use have been drawn up by Captain Creak, R. N., and yourself and three of your officers have gone through a course of instruction at Deptford with Captain Creak and at Kew Observatory. The magnetic observatory on board the *Discovery* has been carefully constructed with a view to securing it from any proximity to steel or iron, and this has involved considerable expense and some sacrifice in other respects. We therefore impress upon you that the greatest importance is attached to the series of magnetic observations to be taken under your superintendence, and we desire that you will spare no pains to ensure their accuracy and continuity. The base station for your magnetic work will be at Melbourne or at Christchurch, in New Zealand. A secondary base station is to be established by you, if possible, in Victoria Land. You should endeavor to carry the magnetic survey from the Cape to your primary base station, south of the 40th parallel, and from the same station across the Pacific to the meridian of Greenwich. It is also desired that you should observe along the tracks of Ross, in order to ascertain the magnetic changes that have taken place in the interval between the two voyages.

8. Geographical discovery and scientific exploration by sea and land should be conducted in two quadrants of the four into which the Antarctic regions are divided for convenience of reference, namely, the Victoria and Ross quadrants. It is desired that the extent of land should be ascertained by following the coast lines, that the depth and nature of the ice cap should be investigated, as well as the nature of the vol-

canic region, of the mountain ranges, and especially of any fossiliferous rocks.

9. A German expedition will start at the same time as the *Discovery*, and it is hoped that there will be cordial coöperation between the two expeditions as regards magnetic and meteorological observations, and in all other matters if opportunities offer for such coöperation. It is understood that the German expedition will establish an observatory on Kerguelen Island, and will then proceed to explore the Enderby quadrant, probably shaping a course south between the 70° E. and 80° E. meridians, with the object of wintering on the western side of Victoria Land, whence exploring sledge parties will be sent inland. The government of the Argentine Republic has undertaken to establish a magnetic observatory on Staten Island.

10. You will see that the meteorological observations are regularly taken every two hours, and, also, in accordance with a suggestion from the Berlin committee, every day at Greenwich noon. It is very desirable that there should, if possible, be a series of meteorological observations to the south of the 74th parallel.

11. As regards magnetic work and meteorological observations generally, you will follow the program arranged between the German and British committees, with the terms of which you are acquainted.

12. Whenever it is possible, while at sea, deep-sea sounding should be taken with serial temperatures, and samples of sea water at various depths are to be obtained for physical and chemical analysis. Dredging operations are to be carried on as frequently as possible, and all opportunities are to be taken for making biological and geological collections.

13. Instructions will be supplied for the various scientific observations; and the officers of the expedition will be furnished with a manual, prepared and edited by Dr. George Murray, on similar lines and with the same objects as the scientific manuals supplied to the Arctic expedition of 1875.

14. On leaving this country you are to proceed to Melbourne, or Lyttelton (Christchurch), New Zealand, touching at any port or ports on the way that you may consider it necessary or desirable to visit for supplies or repairs. Before leaving your base station you will fill up with live stock, coal, and other necessaries, and you will leave the port with three years' provisions on board, and fully supplied for wintering and for sledge-traveling.

15. You are to proceed at once to the edge of the pack and to force your vessel through it to the open water to the south. The pack is supposed to be closer in December than it has been found to be later in the season. But this is believed to depend rather on its position than on the time, and the great difference between a steamer and a sailing vessel perhaps makes up for any difference in the condition of the pack.

16. On reaching the south water you are at liberty to devote to exploration the earlier portion of the navigable season; but such exploration should, if possible, include an examination of the coast from Cape Johnson to Cape Crozier, with a view to finding a safe and suitable place for the operations of landing in the event of your deciding that the ship shall not winter in the ice.

The chief points of geographical interest are as follows: To explore the Ice Barrier of Sir James Ross to its eastern extremity, to discover the land which was believed by Ross to flank the barrier to the eastward or to ascertain that it does not exist, and generally to endeavor to solve the very important physical and geographical questions connected with this remarkable ice formation.

17. Owing to our very imperfect knowledge of the conditions which prevail in the Antarctic seas, we cannot

pronounce definitely whether it will be necessary for the ship to make her way out of the ice before the winter sets in or whether she should winter in the Antarctic regions. It is for you to decide on this important question after a careful examination of the local conditions.

18. If you should decide that the ship shall winter in the ice, the following instructions are to be observed:

a. Your efforts, as regards geographical exploration, should be directed, with the help of depots, to three objects, namely, an advance into the western mountains, an advance to the south, and the exploration of the volcanic region.

b. The director and his staff shall be allowed all facilities for the prosecution of their researches.

c. In carrying out *a* and *b* due regard is to be had to the safety and requirements of the expedition as a whole.

d. You have been provided by Sir Leopold McClintock and by Dr. Nansen with complete details respecting sledge-work both by men and dogs, and you have yourself superintended every item of the preparations connected with food, clothing, and equipment. You will be guided by the information and knowledge thus acquired.

e. Lieutenant Armitage, R. N. R., who has been appointed second in command and navigator to the expedition, has had experience in the work of taking astronomical, magnetic, and meteorological observations during three Polar winters. He has also acquired experience in sledge-traveling and in the driving and management of dogs. You will, no doubt, find his knowledge and experience of great use.

f. Early in 1903 your ship should be free from the ice of the winter quarters, and you will devote to further exploration by sea so much of the navigable season as will certainly leave time for the ship to return to the north of the pack ice. Having recruited at your base station, you will then proceed with your magnetic survey across the Pacific and return to this country.

19. If, on the other hand, you should decide not to winter, you will bear in mind that it is most important to maintain scientific observations on land throughout the winter, and therefore if you are able, in consultation with the director, to find a suitable place for a landing party between Cape Johnson and Cape Crozier, and decide that such a party can be landed and left without undue risk, the following instructions will apply:

a. You will land a party under the command of such person as you may appoint. Such party shall include the director, the physicist, and one of the surgeons, and such other persons as you may consider desirable; but no person is to be left without his consent in writing, which you will be careful to obtain and preserve.

b. You will give every practicable assistance in establishing on land this party, which you will supply with all available requisites, including a dwelling hut, an observer's hut, three years' provisions, stores, fuel, sledges, and dogs.

c. No landing party is to be established on any other part of the coast than that between Cape Johnson and Cape Crozier, as it is above all things essential that in case of accident the approximate position of the party should be known.

d. Before it is so late as to endanger the freedom of your ship, you will proceed north of the pack and carry out magnetic observations with sounding and dredging over as many degrees of longitude (and as far south) as possible, so long as the season and your coal permit, and then return to your base station, whence you will telegraph your arrival and await further instructions.

20. You are to do your best to let us have and to leave where you can state-

ments of your intentions with regard to the places where you will deposit records, and the course you will adopt, as well as particulars of your arrangements for the possible need of retreat, so that in case of accident to the ship or detention we shall be able to use our best endeavors to carry out your wishes in this respect.

21. In an enterprise of this nature much must be left to the discretion and judgment of the commanding officer, and we fully confide in your combined energy and prudence for the successful issue of a voyage which will command the attention of all persons interested in navigation and science throughout the civilized world. At the same time, we desire you constantly to bear in mind our anxiety for the health, comfort, and safety of all entrusted to your care.

22. While employed on this service you are to take every opportunity of acquainting us with your progress and your requirements.

23. In the unfortunate event of any fatal accident happening to yourself or of your inability, from sickness or any other cause, to carry out these instructions, the command of the ship and of the expedition will devolve on Lieutenant Armitage, who is hereby directed to assume command and to execute such part of these instructions as have not been already carried out at the time of his assuming command. In the event of a similar accident to Lieutenant Armitage, the command is to devolve on the executive officer next in seniority on the articles, and so on in succession.

24. All collections and all logs (except the official log), journals, charts, drawings, photographs, observations, and scientific data will be the joint property of the two societies, to be disposed of as may be decided by them. Before the final return of the expedition you are to demand from the naval staff all such data, which are to be sealed up and delivered to the two presidents or dealt with as they may direct. The director of the civilian scientific staff will be similarly responsible for the journals, collections, etc., of the officers under his control. You and the other members of the expedition will not be at liberty without our consent to make any communication to the press on matters relating to the affairs of the expedition, nor to publish independent narratives until six months after the issue of the official narrative. All communications are to be made to us, addressed to the care of the secretary of the National Antarctic expedition, London.

25. The *Discovery* is not one of His Majesty's ships, but is registered under the Merchant Shipping Act, 1894, and is governed by it. Copies of this act will be supplied to you. You will see that the officers and crew sign the ship's articles as required by the act. The scientific staff will not sign articles, but are to be treated as cabin passengers. You must be careful not to take more than 12 persons as passengers.

26. The vessel has been covered by insurance, and, in the event of her sustaining any damage during the voyage, to recover the claim from the underwriters it will be necessary for you to call in the services of Lloyd's agent, or, in his absence, an independent surveyor, at the first port of call, in order that the damage may be surveyed before repairs are effected. His survey report, together with the accounts for repairs and supporting vouchers, should be sent to us by first mail, together with a certified extract from the official log reporting the casualty.

In the event of damage occurring after you have left civilized regions precise particulars should be entered in the log, and the damage should be surveyed and repaired as soon as you return to a port where Lloyd's agent or other surveyor is available.

27. The *Discovery* is the first ship that has ever been built expressly for scien-

tific purposes in these kingdoms. It is an honor to receive the command of her; but we are impressed with the difficulty of the enterprise which has been entrusted to you and with the serious character of your responsibilities. The expedition is an undertaking of national importance, and science cannot fail to benefit from the efforts of those engaged in it. You may rely upon our support on all occasions, and we feel assured that all on board the *Discovery* will do their utmost to further the objects of the expedition.

INSTRUCTIONS TO THE SCIENTIFIC DIRECTOR OF THE CIVILIAN SCIENTIFIC STAFF

1. The Royal Society and the Royal Geographical Society have approved your appointment as director of the civilian scientific staff of their Antarctic expedition.

2. A copy of the instructions to the commander of the expedition accompanies these instructions, which are supplemental to them. You will see from the instructions to the commander what the objects of the expedition are, and your position relatively to them.

3. You will direct the scientific work of the gentlemen who have been appointed to assist you.

4. The names of the gentlemen associated with you are as follows: (1) Mr. Hodgson, biologist; (2) Mr. Shackleton, physicist. The services of the two medical officers will be at your disposal for scientific work when not engaged on the work of their own department, namely, Dr. Koettlitz, botanist, and Dr. Wilson, zoölogist.

5. You will note that the commander of the expedition has been instructed to communicate freely with you on all matters connected with the scientific objects of the expedition, and, as far as possible, to meet your views and wishes in connection with them. The societies feel assured that you will coöperate and act in concert with him, with a view, as far as possible, to secure the success of an enterprise which it is hoped will be attended with important results in the various branches of science which it is intended to investigate.

6. All collections, logs, journals, charts, drawings, photographs, observations, and scientific data will be the joint property of the two societies, to be disposed of as may be decided by them. Before the final return of the expedition you are to demand from the staff under your control all such data, which are to be sealed up and delivered to the two presidents or dealt with as they may direct. On the return of the expedition you will be expected to superintend the distribution of specimens to specialists approved of by the two councils or their representatives and to edit the resulting reports. You will also be expected to contribute a report on the scientific results of the expedition for the official narrative. As it may be desirable during the progress of the voyage that some new scientific discovery should be at once made known in the interest of science, you will in such a case inform us of it by the earliest opportunity.

7. You and the other members of the expedition will not be at liberty, without our consent, to make any communi cation to the press on matters relating in any way to the affairs of the expedition, nor to publish independent narratives until six months after the issue of the official narrative. All communications are to be made to us, addressed to the care of the secretary of the National Antarctic expedition, London.

8. Should any vacancies in the scientific staff occur after the expedition has sailed from England, you may, with the concurrence of the commander, make such arrangements as you think desirable to fill the same, should no one have been appointed from England.

9. You and the members of the scien-

tific staff will be cabin passengers, joining the expedition at your own risk, and neither the owners nor the captain are to be responsible for any accident or misfortune which may happen to you. You will obtain from each member a letter to this effect.

The instructions are signed by the presidents of the Royal Society and the Royal Geographical Society.

URBAN POPULATION OF UNITED STATES*

THE city population of the United States during the ten years ending with the last census increased by nearly 37 per cent, in actual numbers 7,642,817, while the increase in the total population of the country during the same period was not quite 21 per cent.

In 1900 there were 160 cities, 161 including Honolulu, having a population of over 25,000. Of this number nineteen cities contained 200,000 inhabitants or more, nineteen cities had between 100,000 and 200,000 inhabitants, forty cities had between 50,000 and 100,000, and eighty-three had between 25,000 and 50,000. A recent bulletin of the Census Bureau, prepared under the direction of William C. Hunt, gives some interesting facts and figures relative to growth of the city population in the United States.

In 1890 there were 124 cities which had a population of 25,000 or more, but of these cities Brooklyn and Long Island City now form a part of New York city, showing a net gain of thirty-nine cities in 1900, as compared with 1890. Of the 124 cities in 1890, sixteen had 200,000 inhabitants or more, twelve had between 100,000 and 200,000 inhabitants, thirty had between 50,000 and 100,000 inhabitants, and sixty-six had between 25,000 and 50,000.

In 1880 there were but twenty cities which contained more than 100,000 inhabitants, but in 1890 this number had increased to twenty-eight, and in 1900 to thirty-eight.

In 1900 there were seventy-eight cities of 50,000 inhabitants or more, as compared with fifty-eight in 1890 and thirty-five in 1880.

The nineteen cities of the first class comprise New York, which, with more than 3,000,000 inhabitants, properly stands by itself; two cities, Chicago and Philadelphia, each of which has a population in excess of a million; three cities, St. Louis, Boston, and Baltimore, which have a population of half a million each; five cities, Cleveland, Buffalo, San Francisco, Cincinnati, and Pittsburg, which have a population of between 300,000 and 400,000 each, and eight cities, New Orleans, Detroit, Milwaukee, Washington, Newark, Jersey City, Louisville, and Minneapolis, which have a population of between 200,000 and 300,000 each.

The following-named States and Territories in 1900 do not contain any city with a population of 25,000 or more: Arizona, Idaho, Indian Territory, Mississippi, Nevada, New Mexico, North Carolina, North Dakota, Oklahoma, South Dakota, Vermont, and Wyoming.

Of the whole number of cities having 25,000 inhabitants or more in 1900, 70 are found in the North Atlantic division, 49 in the north central division, 18 in the south central division, 12 in the western division, 11 in the South Atlantic division, and 1 in Hawaii. Massachusetts has the largest number of such cities, namely, 20, and is followed by Pennsylvania with 18 and New York with 12.

The most significant growth of cities

* Census Bulletin No. 70.

is that for the three cities in the State of Washington, namely, Seattle, Spokane, and Tacoma. These three cities combined had only 4,981 inhabitants in 1880, but their population had increased to 98,765 in 1890, and to 155,233 in 1900, the increase during the past decade being equivalent to 57.2 per cent.

Nebraska is the only State in which the combined population of the cities contained therein shows a decrease from 1890 to 1900.

There were in 1790 but six places having 8,000 inhabitants or more, containing in all but 131,472 persons, or only 3.4 per cent of the total population at that census. At the census of 1830 the proportion of the total population living in places of like size had been increased to 6.7 per cent, representing 864,509 persons living in 26 places out of a total population for the entire country of 12,866,020. At the census of 1850 there were 2,897,586 persons living in 85 places of upward of 8,000 inhabitants, equivalent to 12.5 per cent of the entire population, which comprised then 23,191,876 persons. In 1880 the proportion, as compared with 1850, had nearly doubled, there being, out of a total population of 50,155,783 at that census, 11,318,547 persons, or 22.6 per cent, living in 286 such places. During the succeeding decade there was a very large increase in urban population, so that at the census of 1890 very nearly 30 per cent of the population was found living in 447 cities or equivalent incorporations of 8,000 inhabitants or more, comprising, as before stated, 18,272,503 persons out of a total population of 62,622,250.

The proportion of urban population has increased during the past ten years at a less rapid rate, there being, according to the figures of the present census, not quite one-third (33.1 per cent) of the population now living in places of 8,000 inhabitants or more, exclusive of Alaska, Indian Territory, Indian reservations, Hawaii, and persons enumerated at stations abroad.

There has been a notable increase since 1890 in the proportion of urban population in the North Atlantic division of States, considered as a whole, and this statement is true, in a somewhat less degree, of the north central division; 58.6 per cent of the total population of the North Atlantic division and 30.6 per cent of that of the north central division in 1900 live in places of 8,000 inhabitants or more, as compared with 51.7 per cent for the former and 25.9 per cent for the latter division at the census of 1890.

In Rhode Island 81.2 per cent of the population in 1900 live in cities or towns of 8,000 inhabitants or more, while this element also constitutes 76 per cent of the population in Massachusetts, 68.5 per cent in New York, 61.2 per cent in New Jersey, and 53.2 per cent in Connecticut. These are the only States, aside from the District of Columbia, in which the proportion of urban population, measured on this basis, is greater than one-half of the total population in 1900, but in Pennsylvania, Delaware, Maryland, Illinois, and California there is between 40 and 50 per cent of the total population living in places of this size.

E. O. Hovey, associate curator of the American Museum of Natural History of New York, is at work in western South Dakota collecting Jurassic fossils for the museum.

Prince Henry of Orleans, who with Bonvalot traversed Tibet in 1890, died at Saigon, French Cochin China, on August 9. The prince had also traveled extensively in Campodia and Tonkin.

GEOGRAPHIC NOTES

THE BALLOON AS AN AID TO EXPLORATION

IT might not be inappropriate at the present time, in view of M. Santos Dumont's success in aerial navigation, to recall the argument of the famous American aeronaut Wise in favor of the use of balloons in exploration.

"If, for instance," writes Mr. Wise, in "A System of Aeronautics," 1850, "we take a balloon of limited size, about 18 feet in diameter each way, it will, when inflated with hydrogen gas, be capable of raising 160 pounds, independent of its own weight. Now, if this be so fastened to a man's body, as not to interfere with the free use of his arms and legs, he may then ballast himself so as to be a trifle heavier than the upward tendency of the balloon, which will be nearly in equilibric." . . . "He may then bound against the earth with his feet so as to make at least a hundred yards at each bound.

"This the writer has often done, in the direction of a gentle wind, with the aid of his feet alone, after his balloon had descended to the earth; and, on one occasion, traversed a pine forest of several miles in extent, by bounding against the tops of the trees. Such a contrivance would be of inestimable value to exploring expeditions. Landings to otherwise inaccessible mountains; escapes from surrounding icebergs; explorations of volcanic craters; traversing vast swamps and morasses; walking over lakes and seas; bounding over isthmuses, straits, and promontories, or exploring the cloud-capped peaks of Chimborazo, could thus all be easily accomplished."

POPULATION OF CANADA

THE population of the Dominion of Canada is given by the recent census as 5,338,883, an increase of 505,644, or about 10½ per cent, during the last ten years. The population of the provinces is as follows:

Provinces.	1891.	1901.
British Columbia	98,173	190,000
Manitoba	152,506	246,464
New Brunswick	321,263	331,093
Nova Scotia	450,396	459,116
Ontario	2,114,321	2,167,978
Prince Edward Island	109,078	103,258
Quebec	1,488,535	1,620,974
Territories	66,799	145,000
Unorganized territories	32,168	75,000

The population of the principal cities of Canada, by municipal boundaries, is as follows:

Cities.	1891.	1901.
Montreal	220,181	266,826
Toronto	181,220	207,971
Quebec	63,090	68,834
Ottawa	44,154	59,902
Hamilton	48,980	52,550
Winnipeg	25,639	42,336
Halifax	38,495	40,787
St. John	39,179	40,711
London	31,977	37,983
Victoria	16,841	20,821
Kingston	19,263	18,040
Vancouver	13,709	26,196
Brantford	12,753	16,631
Hull	11,264	13,988
Charlottetown	11,373	12,080
Valleyfield	5,515	11,055
Sherbrooke	10,097	11,765
Sydney	2,427	9,908
Moncton	5,165	9,026
Calgary	3,876	12,142
Brandon	3,778	5,738

A study of the population by families compared with 1891 is very interesting. In nearly every province the per cent of increase by families is considerably greater than the per cent of increase of the actual population.

Provinces.	1891.	1901.
British Columbia	20,718	30,000
Manitoba	31,786	48,590
New Brunswick	58,462	62,700
Nova Scotia	83,730	89,106
Ontario	414,796	451,839
Prince Edward Island	18,601	18,746
Quebec	271,991	303,301
Territories	14,415	29,500
Unorganized territories	32,168	75,000

The dwellings are as follows:

Provinces.	1891.	1901.
British Columbia	20,016	38,000
Manitoba	30,790	47,903
New Brunswick	54,718	58,227
Nova Scotia	79,102	85,032
Ontario	406,946	440,419
Prince Edward Island	18,389	18,530
Quebec	246,644	287,533
Territories	14,129	28,300

The returns for extreme northern portions of Quebec and Ontario and for the unorganized territories of Athabasca, Franklin, Keewatin, MacKenzie, Ungava, and Yukon have not been received.

COAL IN THE UNITED STATES

THE output of coal in the United States for 1900 for the second successive year surpassed the output of Great Britain during the same period. Mr. Edward W. Parker, statistician of the U. S. Geological Survey, reports the total output in 1900 in the United States as 267,542,444 short tons, an increase over the preceding year of 13,802,452 tons, or a little more than 5 per cent. The output in Great Britain for the year was 15,000,000 short tons less. West Virginia showed the largest increase in tonnage, her output exceeding 21,000,000 tons for the first time. Ohio showed the next largest increase, and Alabama, Arkansas, the Indian Territory, Michigan, and Utah also made very notable gains. The output in Kansas increased by 600,000 tons, or 16 per cent, and that of Kentucky by 575,000 tons, or 12 per cent.

The following table, prepared by Mr. Parker, gives the production and value of coal (in short tons) in the different States in 1900:

	Production.	Value.
Alabama	8,393,385	$9,745,722
Arkansas	1,441,345	1,653,818
California	171,708	523,231
Colorado	5,232,643	5,848,339
Georgia and North Carolina	333,291	370,022
Illinois	25,153,929	22,529,665
Indiana	6,449,645	$6,645,739
Indian Territory	1,918,572	2,782,838
Iowa	5,237,634	7,202,986
Kansas	4,453,107	5,368,642
Kentucky	5,181,917	4,730,698
Maryland	4,024,688	3,927,381
Michigan	849,455	1,259,683
Missouri	3,269,491	4,015,980
Montana	1,661,775	2,713,707
New Mexico	1,299,099	1,775,570
North Dakota	129,883	158,358
Ohio	19,105,408	19,403,362
Oregon	58,864	220,001
Pennsylvania:		
Anthracite	57,107,660	82,993,471
Bituminous	79,616,346	77,166,158
Tennessee	3,731,617	4,215,080
Texas	968,373	1,581,914
Utah	1,146,277	1,445,415
Virginia	2,137,007	1,757,525
Washington	2,474,093	4,700,068
West Virginia	21,980,430	17,698,734
Wyoming	4,014,602	5,457,953

Adolf Erik Nordenskjold, the first and only explorer to accomplish the Northeast Passage, died at his home, in Stockholm, on Tuesday, August 13. Nordenskjold was born 69 years ago at Helsingfors, the capital of Finland. He had but reached the age of manhood when he fell under the suspicion of the Russian authorities and was compelled to leave the country. He settled in Sweden and soon became interested in Arctic exploration. Nordenskjold had already spent 20 years adding to the maps of Greenland, Spitzbergen, and the Kara Sea, which he was one of the first to penetrate, when he determined to reach Bering Strait by crawling around the headlands and islands of northern Asia. Without any hindrance he had arrived almost in sight of the strait when the tantalizing ice closed in before him, and for ten months his ship was held motionless. Then the ice mass opened and allowed the *Vega* to sail the few remaining miles to and through the strait and thus to complete the Northeast Passage (1879). He did a great deal to promote navigation along the north coast of Siberia and to lead commerce to the mouths of the great Siberian rivers—Obi, Yemsei, and Lena.

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